

I Claim:

1. Apparatus for freeing a seized valve having an elongate valve actuating stem projecting out of the valve, comprising means for enabling the repeated application of an impact force to the valve actuating stem alternately in opposite directions along its longitudinal axis.
2. Apparatus as claimed in claim 1, comprising gripping means for gripping and engaging with a projecting portion of the valve actuating stem.
3. Apparatus as claimed in claim 2, wherein the gripping means comprises a plurality of jaws.
4. Apparatus as claimed in claim 2 or claim 3, wherein the gripping means is arranged to grip and engage a projecting portion of the valve actuating stem when an impact force is applied in a first direction to allow an impact force to be applied by the gripping means to the projecting portion of the valve actuating stem in the opposite direction.
5. Apparatus as claimed in claim 4, wherein the jaws comprise means for enhancing the engagement of the jaws with the projecting portion of the valve actuating stem.
6. Apparatus as claimed in claim 5, wherein the means for enhancing engagement of the jaws comprises a plurality of teeth members.
7. Apparatus as claimed in claim 6, wherein the teeth members are elongate.
8. Apparatus as claimed in claim 7, wherein the elongate teeth members are aligned substantially perpendicularly to the longitudinal axis of the valve actuating stem.
9. Apparatus as claimed in any of claims 4 to 8, comprising a base portion to which the impact force is applied and wherein the gripping means is movable with respect to the base portion in the direction of application of the impact force, the base portion urging the gripping means into engagement with the projecting valve actuating stem upon application of the impact force.
10. Apparatus as claimed in claim 9, comprising camming surfaces on the base portion and on the gripping means for urging the gripping means into engagement with the

projecting valve actuating stem upon relative movement of the base portion and the gripping means.

11. Apparatus as claimed in claim 9 or claim 10, wherein the base portion urges the gripping means into engagement with the projecting valve actuating stem upon application of an impact force in one direction.

12. Apparatus as claimed in claim 11, wherein the base portion urges the gripping means into engagement with the projecting valve actuating stem upon application of an impact force towards the stem.

13. Apparatus as claimed in claim 12, wherein the base portion comprises a shank to which the impact force is applied and the gripping means comprises a collar which is slidably disposed on the shank and opposed jaws for engaging opposite sides of a projecting valve actuating stem, the base portion and the opposed jaws comprising camming surfaces for urging the jaws in a gripping direction.

14. Apparatus as claimed in claim 11, wherein the base portion urges the gripping means into engagement with the projecting valve actuating stem upon application of an impact force away from the stem.

15. Apparatus as claimed in claim 14, wherein the impact force is applied to the base portion and the gripping means comprises opposed jaws for engaging opposite sides of a projecting valve actuating stem, the base portion and the opposed jaws comprising camming surfaces for urging the jaws in a gripping direction.

16. Apparatus as claimed in claim 2, comprising a socket for engagement with the projecting portion of the valve actuating stem and means for securing the socket to the projecting portion.

17. Apparatus as claimed in claim 16, comprising a retaining member insertable into aligned apertures in the socket and the projecting portion.

18. Apparatus as claimed in claim 17, wherein the socket comprises aligned apertures in opposed portions and wherein the retaining member passes through one aperture in

the socket, through the aligned aperture in the projecting portion and through the further aligned aperture in the socket.

19. Apparatus as claimed in claim 17 or claim 18, wherein the retaining member comprises a retaining pin.
- 5 20. Apparatus as claimed in claim 1, comprising engagement means for engaging a handwheel connected to a valve actuating stem.
21. Apparatus as claimed in claim 20, wherein the engagement means comprise hook means for hooking under a portion of the handwheel.
22. Apparatus as claimed in claim 21, wherein the hook means is connected to a portion
10 to which the impact force is applied.
23. Apparatus as claimed in claim 2 or claim 3, including means enabling the closed jaws, when gripping the valve actuating stem, to be subjected to impact forces in a rotational direction relative to the longitudinal direction of the valve stem.
24. Apparatus as claimed in claim 23, wherein the impact forces in the rotational
15 direction are established by means of a rotary member which can be angularly displaced in opposite directions between engagement with stop members fixed relative to the gripping means.
25. Apparatus as claimed in claim 24, wherein the angular displacement of the rotary member is achievable manually or by means of a powered drive.
- 20 26. Apparatus as claimed in claim 24 or 25, wherein said rotary member is displaceable longitudinally relative to said stop members whilst remaining engageable therewith, there being provided to define the extremes of the longitudinal movement of the rotary member respective stop members, engagement of the rotary member with said stop members providing said impact forces along the longitudinal axis of the valve
25 stem.
27. Apparatus as claimed in claim 24, 25 or 26, wherein said rotary member is coupled to a mass which can be varied to suit the application.

28. Apparatus for freeing a seized valve having an elongate valve actuating stem

projecting out of the valve, the apparatus comprising:

a force transmitting member adapted to join with both an exposed end portion of said valve actuating stem and an external impact producing device such that the

5 external impact producing device can transmit a force through the force

transmitting member, which force is transmitted substantially along the

longitudinal axis said valve actuating stem; and

a plurality of jaws for gripping and engaging with a projecting portion of the

valve actuating stem, wherein the plurality of jaws are arranged to grip and

10 engage the projecting portion of the valve actuating stem when the impact force is applied in a first direction to allow a force to be applied by the plurality of jaws to the projecting portion of the valve actuating stem in the opposite direction.

29. Apparatus as claimed in claim 28, wherein the force transmitting member comprises

an energy storage device arranged to transmit a portion of the impact force in the first

15 direction to the projecting portion of the valve actuating stem and storing a portion of

the impact force in the first direction, the energy storage device being further

configured to transmit in the opposite direction a portion of the stored portion of the

impact force to the projecting portion of the valve actuating stem.

30. Apparatus as claimed in claim 28 or claim 29, wherein the plurality of jaws comprises

20 a plurality of teeth members that enhance the engagement of the jaws with the

projecting portion of the valve actuating stem.

31. Apparatus as claimed in claim 30, wherein the teeth members are elongate.

32. Apparatus as claimed in claim 31, wherein the elongate teeth members are aligned

substantially perpendicularly to the longitudinal axis of the valve actuating stem.

25 33. Apparatus as claimed in any of claims 28 to 32, comprising a base portion to which the impact force is applied and wherein the plurality of jaws are movable with respect to the base portion in the direction of application of the impact force, the base portion

urging the plurality of jaws into engagement with the projecting valve actuating stem upon application of the impact force.

34. Apparatus as claimed in claim 33, comprising camming surfaces on the base portion and on the plurality of jaws for urging the plurality of jaws into engagement with the projecting valve actuating stem upon relative movement of the base portion and the plurality of jaws.

35. Apparatus as claimed in claim 33 or claim 34, wherein the base portion urges the plurality of jaws into engagement with the projecting valve actuating stem upon application of an impact force in one direction.

36. Apparatus as claimed in claim 35, wherein the base portion urges the plurality of jaws into engagement with the projecting valve actuating stem upon application of an impact force towards the stem.

37. Apparatus as claimed in claim 36, wherein the base portion comprises a shank to which the impact force is applied and the plurality of jaws comprise a collar, which are slidably disposed on the shank and opposed jaws for engaging opposite sides of a projecting valve actuating stem, the base portion and the opposed jaws comprising camming surfaces for urging the plurality of jaws in a gripping direction.

38. Apparatus as claimed in claim 35, wherein the base portion urges the plurality of jaws into engagement with the projecting valve actuating stem upon application of an impact force away from the stem.

39. Apparatus as claimed in claim 38, wherein the impact force is applied to the base portion and the plurality of jaws comprise opposed jaws for engaging opposite sides of a projecting valve actuating stem, the base portion and the opposed jaws comprising camming surfaces for urging the plurality of jaws in a gripping direction.

40. Apparatus as claimed in claim 28, comprising a socket for engagement with the projecting portion of the valve actuating stem and means for securing the socket to the projecting portion.

41. Apparatus as claimed in claim 40, comprising a retaining member insertable into aligned apertures in the socket and the projecting portion.
42. Apparatus as claimed in claim 41, wherein the socket comprises aligned apertures in opposed portions and wherein the retaining member passes through one aperture in the socket, through the aligned aperture in the projecting portion and through the further aligned aperture in the socket.
43. Apparatus as claimed in claim 41 or claim 42, wherein the retaining member comprises a retaining pin.
44. Apparatus as claimed in claim 28, comprising engagement means for engaging a handwheel connected to a valve actuating stem.
45. Apparatus as claimed in claim 44, wherein the engagement means comprise hook means for hooking under a portion of the handwheel.
46. Apparatus as claimed in claim 45, wherein the hook means is connected to a portion to which the impact force is applied.
47. Apparatus as claimed in claim 28, comprising a plurality of rotational force transmitting members in communication with the plurality of jaws that enable the closed jaws, when gripping the valve actuating stem, to be subjected to impact forces in a rotational direction relative to the longitudinal direction of the valve stem, wherein the plurality of jaws are configured to grip and engage the projecting portion of the valve actuating stem when the impact force is applied in the rotational direction.
48. Apparatus as claimed in claim 47, wherein the impact forces in the rotational direction are established by means of a rotary member which can be angularly displaced in opposite directions between engagement with stop members fixed relative to the plurality of jaws.
49. Apparatus as claimed in claim 48, wherein the angular displacement of the rotary member is achievable manually or by means of a powered drive.

50. Apparatus as claimed in claim 48 or 49, wherein said rotary member is displaceable longitudinally relative to said stop members whilst remaining engageable therewith, there being provided to define the extremes of the longitudinal movement of the rotary member respective stop members, engagement of the rotary member with said stop members providing said impact forces along the longitudinal axis of the valve stem.
51. Apparatus as claimed in claim 48, 49 or 50, wherein said rotary member is coupled to a mass which can be varied to suit the application.
52. A method of freeing a seized valve having an elongate valve actuating stem projecting out of the valve, comprising repeatedly applying an impact force to the valve actuating stem alternately in opposite directions along its longitudinal axis.
53. A method as claimed in claim 52, further comprising application of a torque to the valve actuating stem.
54. A method as claimed in claim 52, wherein the torque is applied simultaneously with the application of the impact force.
55. A method as claimed in claim 52, wherein the torque is applied after the repeated application of the impact force.
56. A method as claimed in claim 52, wherein the valve is subjected also to repeated torsional impacts in opposite rotational directions.